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A COMPARISON BETWEEN WATER RELATED STRATEGIES – LEADING TO A PROPOSED ROMANIAN WATER SECURITY STRATEGY

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ABSTRACT. This article makes a comparative analysis between the National Strategy for Water Management in Romania draft (which is in the final steps of being approved), the Someș Water Company (CAS) master plan, the Romanian national management plan related to the Danube's River basin portion in Romania and the strategies of the authorities from England and those from the USA, which have a focus on water security. A comparison between the different paradigms of these 5 parties will be made, that will represent the basis of the author's proposal for an alternative National Water Security Strategy in Romania. At the end, the necessary recommendations will be made for the development of such a strategy as well as other recommendations in case it will not be developed.

Key words: *national water security strategy plan, concept of water security, water in Romania, water as an economic good, water quality in the environment.*

INTRODUCTION

Since water is a vital resource, individuals, communities or countries have always thought of measures to ensure water security. If on an individual level, people have found simple solutions to solve specific needs, on a macro

level, countries have legislated to clearly establish how water can be used. However, there are countries or legal entities that decided to develop strategies in order to provide predictability, a *modus operandi* and accelerate the measures that must be implemented to ensure water security (Bakker, 2012) (Grey and Sadoff, 2007) (Shrestha et al., 2018) (Siskaa and Takara, 2015).

This article presents different (statal / company based) views on the concept of water security, views that have a direct impact on policy in the field. The strategies developed by the United States of America, England and the Someș Water Company (CAS) from Romania will be analyzed. It is important to mention that Romania is in the process of implementing a National Strategy for Water Management (NSWM).

Hypotheses and objectives

This article starts from two hypotheses. The first was that large state entities would develop water security strategies with a global impact. The second assumption is that smaller states will implement a national strategy that will coordinate the individual or joint efforts of water operators to achieve their objectives.

The objectives of this article are:

- to identify and compare water security strategies of some large, medium-sized state actors and Romania (through its regional operators).
- to identify those elements that can form the basis of an alternative Romanian water security strategy, a strategy that will later be put into practice by operators and local decision-makers

METHODS AND MATERIALS

In order to achieve the established objectives, public data and specialized literature were consulted, and, in the end, 5 distinct entities were chosen, three being state actors and two regional one.

United States of America

Although, at least at the declarative level, water security is important for each state, the actions by which it is ensured differ. One of the strongest signals in this regard is provided by the United States of America, which in 2017 developed a global water strategy, and in 2021 mentioned the importance

of water security in the country's national security strategy (USA 2021). They have assumed the role of world leader with the vision of creating a safer world, where both the quantitative/qualitative people needs and the economic and environmental ones are satisfied, while managing to effectively deal with floods and drought (Brouwer et al., 2008) (Group World Bank, 2016).

Thus, if we take a look at USA's Strategy (USA, 2017), it can be seen that, in its 70 pages, 4 major objectives are established:

- Increasing access to drinking water and sanitation services,
- Water resources management – focused on the protection of fresh water sources
- Promoting cooperation regarding shared waters
- Strengthening the financing and institutions of the water sector.

The first objective aims to reduce mortality caused by lack of water or sanitation services, in conjunction with combating epidemics caused by Zika or malaria. This is to be achieved by increasing access to potable water. This way, the premises of more stable and responsible governments can be created, which through a domino effect, would lead to the reduction of conflicts, well-being, the reduction of social tensions that could lead to revolutions or could represent a suitable area for the recruitment of terrorists.

The second objective resides in the impact of pollution, increased demand or the drying up of some water sources could have on the GDP of some countries, which, according to the World Bank Group (2016), could decrease by 6-15%.

The third objective aims to reduce conflicts by promoting cooperation on shared water resources. According to the United Nations (USA, 2017), there are more than 260 river basins and 600 aquifers shared by two or more countries. Moreover, according to the United Nations Environment Programme (UNEP, 2002), in many of these cases there is no formal agreement or institutional relationship between the parties to regulate the use of these shared water resources. The US government intends to work to strengthen the political will for cooperation and to promote the development of agreements and mechanisms that support the cooperative management of shared water resources in regions where water is or may become a source of conflict.

The last objective is to strengthen the financing and institutions of the water sector. The US government will seek to strengthen governance, financing, and institutions in the water sector at all levels, with the goal of reducing dependence on donors and external actors. In order to act on the basis of the elaborated strategy, 5 measures are considered:

- providing technical assistance,
- investing in sustainable infrastructure and services,
- promoting science, technology, innovation and information,
- mobilizing financial resources,
- diplomatic approaches or strengthening partnerships, of intergovernmental organizations and the international community.

In fact, to implement this strategy, 17 institutions will work together, as shown in table 1, each with clearly defined tasks. This interdepartmental department will meet monthly in Washington DC as well as in countries where the US conducts missions.

Table 1. *Agencies contributing to the implementation of the global water strategy*[1]

Means of involvement	**Strategic objectives**			
	Objective 1	**Objective 2**	**Objective 3**	**Objective 4**
Technical support	CDC, DOI, EPA, MCC, NIST, USACE, USAID, USDA	DOI, EPA, MCC, NIST, USACE, USAID, USDA	DOI, DOS, EPA, USACE	DOI, EPA, MCC, USAID
Sustainable infrastructure and services	DOI, EPA, MCC, USAID	DOI, EPA, MCC, USAID, USDA	DOI, EPA	DOI, EPA, MCC, USAID
Science, Technology & Innovation	CDC, DOI, EPA, NASA, USAF, USAID	DOI, EPA, NASA, NOAA, USAID, USACE, USAF, USDA	DOI, EPA, NASA, NOAA, USACE, USAF	DOI, EPA, NASA, USAF, USAID
Resource mobilization	MCC, OPIC, USAID	MCC, OPIC, USAID	DOS	MCC, USAID
Diplomatic involvement	DOS	DOS	DOS	DOS

[1] CDC-Centers for Disease Control and Prevention; DOI – U.S. Department of the Interior (U.S. Geological Survey and/or Bureau of Reclamation); DOS – U.S. Department of State; EPA – U.S. Environmental Protection Agency; MCC – Millennium Challenge Corporation; NASA – National Aeronautics and Space Administration; NIST – National Institute of Standards; OPIC – Overseas Private Investment Corporation; USAID – U.S. Agency for International Development; USACE – U.S. Army Corps of Engineers; USAF -U.S. Air Force; USDA – U.S. Department of Agriculture

England

The Governments strategy (Affairs, 2008), addresses in its 98 pages, a number of aspects regarding water in that area. These include: demand, supply, water quality, surface water drainage, coastal and river flooding, greenhouse gas emissions, water charging, regulatory framework and innovation as well as development of implementation measures.

As for demand, it has undergone a change in recent decades, representative being the decrease in water consumed by industry and the increase in water used by the growing population of the country, which ended up using approx. 52% of treated water.

Besides speeding up the water metering, a series of measures are suggested by which the population can reduce water consumption to 130-120 l/day. Moreover, the authorities have imposed standards for new buildings so that the volume of water consumed is reduced. A series of programs have been implemented through which the industry can also reduce its consumption by approx. 20% by 2020, but without compromising on quality and hygiene. As for agriculture, in 2008 it was estimated to use only 1% of water resources. Furthermore, estimates indicated that the need for irrigation water would increase by up to 20% in 2020 or 30% in 2050. Thus, the authorities developed a guide to best practices for irrigation and invested in research aimed at reducing water use in production of new crops or generate superior techniques/ technology.

Losses are another big problem in English distribution networks, many of which date back to the era of Queen Victoria. Although they managed to reduce their losses by 33% in the period 1994-2008, approx. a quarter of the water was being wasted at the time the strategy was drawn up.

In terms of delivery, the strategy foresees a series of measures including: creation of new water sources as well as optimization of the management of existing ones, regional collaboration of water companies, where possible, using water resources more sustainably especially during periods of drought.

Water companies were advised to conduct their own analyzes of customer demand and assess the impact that climate change or other factors might have on supply capacity in order to identify the best ways to reduce consumption (Alavian et al., 2009) (Ching, 2016) (Hallegatte et al.,2007) (Stringer et al., 2021) (Takaffuji et al, 1997) (Zhou et al., 2023) (Velazquez, 2006).

Contingency planning is another chapter mentioned in the English strategy. Thus, water companies must meet the legal requirements to deal with emergency situations and carry out guarding, protection and supervision of installations. Moreover, they must collaborate with other responders to improve emergency preparedness. These plans include alternative water delivery solutions in the event of a main failure.

Another crucial chapter is water quality improvement. Exemplary in this respect are the measures to reduce phosphates in cleaning products. Another measure is pollution taxation, according to the "polluter pays" principle, which aims to recover the costs of treatment and disposal. In relation to pollution from agriculture, The England Catchment Sensitive Farming Delivery Initiative (ECSFDI) has been established which aims to manage land in order to control the diffuse pollutant emissions. According to the strategy, the focus must be on chronic polluters, especially diffuse ones at the expense of point pollutions because it affects a large part of rivers, groundwater, and over half of the lakes. Nitrates remain the most common pollutant in the environment, but great emphasis is also placed on those substances that have the ability to persist or (bio)accumulate.

Groundwater is crucial in maintaining water balance in nature by feeding rivers and wetlands during droughts. So, to protect this resource, a new groundwater directive was implemented with the aim of reviewing and improving the measures.

Regarding water quality, an important aspect mentioned in the strategy is the fact that water must be safe at the point of supply, i.e. at the tap of the final consumer.

Another chapter of the English strategy concerns surface water drainage, especially when 40% sewage system is used for both waste water and meteoric water. Therefore, many solutions were put in place, among which the extension of sewerage systems or the usage of sustainable drainage systems that copy the capture, slow infiltration and storage process of nature.

A separate chapter specific to English strategy is flooding in river or coastal areas. It led to the "Make space for water" policy which is leaving room for the implementation of pilot or national projects to reduce the risks caused by floods

Another chapter is represented by CO_2 emissions. The English authorities have determined that the water industry as a whole, produces less than 1% of total CO_2 emissions, but despite this, they aim to reduce this impact. Among the objectives drawn when the strategy was drawn up, there is a 60% reduction in total emissions by 2050, and with regard to the water industry, the authorities

were considering increasing the percentage of energy coming from renewable resources from 5% to 20 % in 2020.

A separate chapter is the invoicing of the supplied water. At the time the strategy was drawn up, on average, only 30% of households were metered by water meters, the percentage varying between 7% and 66% depending on the supplying company. So, the English authorities and companies in the industry decided to implement measures to double customer metering by 2030.

A distinct chapter of the strategy is the regulatory framework, competition and innovation. As the water industry is monopolistic in nature, regulation is required, which is provided by 3 entities: Ofwat (the Water Regulatory Authority), the Drinking Water Inspectorate and the Environment Agency, each with a well-established role.

All policies are developed with the interests of consumers in mind, who are represented in relation to water companies by the CCW (The Consumer Council of Water). It is desired to increase the degree of innovation in the industry by stimulating competitiveness / competition as well as by liberalizing the market.

The current situation in Romania and Cluj-Napoca area

Romania, through the Ministry of the Environment, developed a draft of the National Strategy for Water Management (2024) (NSWM), which is currently taking the necessary steps to be completed and ratified. In this material, the term “water security” appears only twice.

The strategy is composed out in 8 chapters spread over 65 pages.

The first presents the purpose of developing the strategy, in conjunction with the European and global context.

The second chapter presents the current situation of water in Romania (resources, legal and institutional framework, as well as that of the human resources involved).

In the third chapter, the vision, principles and objectives of the strategy are highlighted.

The 4 objectives are focused in two directions: water management and legislation & institutional organization, each one based on 3 specific objectives. The 4 objectives are:

- Integrated management of water resources to ensure the sustainable use of water resources. A series of recommendations from the EU as well as quantitative and qualitative water monitoring activities are presented.

- Management and protection of water resources in order to achieve and preserve the good condition of surface and underground water and prevent its deterioration. It aims to reduce and avoid pollution of water sources. The development of a subsumed Strategy regarding water supply, collection and treatment of waste water is being considered.

- Reducing water-related risks in the context of climate change (water shortage and drought, erosion of banks and cliffs; destructive actions of floods) on the population, economic activity, environment and cultural heritage. The emphasis is on flood protection, presenting the 3 stages through which Romania will implement Directive 60/2007/C.E. regarding flood risk assessment and management.

- Development of the legislative, organizational and scientific framework in the field of water management

Chapter 3 is incompletely elaborated, but it is intended to focus on water in relation to the population (where there are some desired goals to be achieved, such as connection to water and sewage), energy, industry, agriculture, ecotourism and the environment.

Chapter 4 presents a series of measures and actions aimed at:

- Development of water monitoring measures and data exchange through international platforms

- Water related works aimed to satisfy water needs of the users and achieve/maintain environmental objectives. These lack concreteness, being rather objectives of other strategies or plans.

- Rehabilitation, maintenance and modernization of existing works. Although the importance of such measures is highlighted, there is no mention of who is responsible, the implementation period, the way of implementation or the sources of funding.

- Non-structural measures for the development, sustainable use and protection of water resources: such as the restoration of longitudinal and lateral connectivity of water bodies or the creation of afforestation in vulnerable areas.

- Consolidation of water education (through a collaboration between educational units and the Romanian National Water Administration), training and professional development of human resources in the water sector.

- The responsible participation of all interested parties, communities and local authorities in the implementation of measures and actions in the field of water.

Chapter 5 covers the process of strategic planning in the field of water and the development of public policies. In this sense, the aim is to create a national action plan with the aim of translating the National Strategy for Water

Management into reality. Details regarding the parties involved in achieving certain strategic objectives, the implementation period and the sources of funding are presented in the 3rd annex of the strategy.

Chapter 6 presents the expected results, which, in fact, represent the achievement of the strategy's objectives.

Chapter 7 lists the funding sources: European ones, loans or the state budget.

The last chapter is intended to evaluate the stage of strategy implementation and monitor progress.

National Management Plan Related to the National Portion of the Danube River Basin (NMPPNPDRB)

Previously, Romania developed a National Management Plan Related to the National Portion of the Danube River Basin (NMPPNPDRB), which was updated in (2021). Its content is vast (two volumes: 448 pages + 411 annexed pages) – 9 chapters, through which the Romanian state aims to:

1. Presents the hydrographic areas/basins of Romania;

2. Characterize surface and underground waters - the main categories of water, the pressures on them, the evaluation of the anthropogenic impact on the state of water bodies are presented.

3. Identify protected areas. This chapter classifies protected areas according to their use: drinking water, protecting economically important species, important for habitat, recreation, or areas sensitive to nutrient and nitrate pollution.

4. It presents the way in which the state of the waters is monitored and characterized. Surface and groundwater monitoring networks and programs (quantitative and qualitative) are presented. A characterization of underground and surface water bodies is also done (chemical status assessment, predictions).

5. Define environmental objectives;

These are broken down into 3 objectives for:

• groundwater – reaching good quantitative chemical states;

• surface waters – achieving good ecological and chemical status for natural water bodies, good ecological potential and good chemical status for heavily modified and artificial water bodies.

• protected areas – achieving the objectives provided by the specific legislation.

6. Make an economic analysis of water use;

The analysis is based on economic data at the level of watersheds, taking into account general indicators such as: population, GDP, gross value added and the correlation of these indicators with the use of water both at the resource level and at the service level (water supply, sewage and wastewater treatment).

7. Presents programs of measures as well as exceptions to environmental programs

The Water Framework Directive establishes a legal framework for protecting, conserving and improving the status of all waters and protected areas, preventing deterioration and ensuring the long-term sustainable use of water resources. This defines two categories of measures: “basic”, which are minimum compliance requirements and consist of those measures required by the implementation of Community legislation for water protection, and “additional” measures, being those measures identified and implemented in addition to the basic measures. Part of the measures can be found in 19 national plans and strategies, which have a greater or lesser impact, directly or indirectly, on water.

The chapter also presents the levels of implementation of measures in different projects that have an impact on water.

8. It addresses climate change and the impact it may have.

The main conclusions are that: the water exploitation index (WEI) indicates a relatively low water stress/deficit, of approx. 4%. After analyzing the variation trends of the meteorological parameters and the simulations of the flow evolution, with the exception of the Someş River, whose flow is expected to increase by approx. 6.2%, all other large rivers of the country will decrease in flow.

The forecasted water requirement for 2030 in the Someș-Tisa River basin will be in a slight decrease in the urban environment, from 102.96 million m^3 in 2020 to 102 million m^3 in 2030 and in a slight increase in the rural environment, from 88.30 million m^3 in 2020 to 88.96 million m^3 in 2030. Additionally, the water requirement for industrial use is expected to increase from 91.77 million m^3 in 2020 to 113.50 million m^3. Similarly, the water requirement for irrigation is expected to increase from 0 million m^3 in 2020 to 1.30 million m^3 in 2030. In zootechnics, the expected effect will be the opposite, with the water requirement decreasing from 17.38 million m^3 in 2020 to 16.56 million m^3 in 2030.

9. Presents aspects of public information and participation.

It presents the legal basis according to which citizens can inform themselves and consult with the authorities. These activities are undertaken by the 11 water basin administrations, which implement the procedures in order to carry out the activity of information and consultation of the interested factors regarding each important stage in the implementation process of the Water Framework Directive.

The Someș-Tisa Water Basin Administration (ABAST) and the Someș Water Company (CAS) do not have a proper strategy regarding the security of water or water sources, but various management plans.

Someș Water Company Master Plan

The Someș Water Company is a regional operator of water supply, collection and purification, which serves approx. 750,000 customers located in Cluj and Sălaj counties. As communicated to the general public (SA, 2022), the operator informs the public that it is acting on the basis of a master plan (SA 2006) elaborated in 2006 and updated in 2012, aimed at aligning with the requirements of the European Directives in the field of water, sewage and treatment services, as well as expanding the water supply and sewage networks in Cluj and Sălaj counties, investments valued at approx. 800 million euros.

According the Ministry of the Environment (2021), in 2018, in the ABAST area, the amount of population connected to water and sewage services was as follows: 72% of the population connected to drinking water, 51% of the population connected to the sewage system and 50% of the population connected to the sewage treatment plant.

The CAS has a Master Plan is structured in 12 chapters, the content of which is public, with the exception of chapter 11, which refers to the complete plans of the networks, information of strategic importance that is not intended for the public. The material is vast, the 11 chapters have over 1,000 pages + appendices.

The general objective of the Master Plan aims to identify and prioritize investment needs at the lowest costs in order to comply with European Directives and fulfill Romania's commitments at the accession time in the European Union. Investment planning is done according to the Terms of Reference, over a period of 25 years starting in 2015, when the first stage ends.

Thus, it can be concluded that the CAS strategy is built on the idea of making investments through which to achieve all its proposed objectives.

The respective master plan is based on 8 objectives:

1. Improving drinking water quality for its customers
2. Providing water to all consumers;
3. Significant reduction of water losses;
4. Reduction of maintenance and operation costs;
5. Balancing water supply systems;
6. Reducing the number of breakdowns and increasing the level of satisfaction of customer requirements;
7. Elimination of pollution of the environment and watercourses;
8. Improving the performance of operational, financial and environmental management.

The total cost for capital investment, reinvestment, operation and maintenance, for the expansion and rehabilitation of water and wastewater systems in the CAS operating area calculated for the period 2011-2040 was estimated at 1.74 billion euros (at 2011 value) and can increase up to 2.18 billion euros depending on the value of the currency exchange rate, of which approx. 0.95 billion is just new investment.

RESULTS AND PROPOSAL

It is important to highlight the fact that the previous chapter analyzes, on one hand, strategies (USA and England), and on the other, management plans (Romania and Compania de Apa Someș). The difference is noticeable from the initial reading of the materials. The strategies of the western countries are shorter, more comprehensive, easier to understand and assimilated by readers, environmental specialists, representatives of local authorities, commercial companies or individuals. Strategies have simple language and indicate the broad lines of action, based on objectives set at a strategic level. Additionally, it clearly indicates the responsibilities of the parties involved. On the other hand, the management plans used in Romania are exhaustive, cumbersome, long and are written using a technical language. They require specialized training to be followed and understood, a fact that complicates the efforts of those beneficiaries/local institutions that have to implement them.

Authors proposal regarding the elaboration of the Romanian Water Security Strategy (RWSS)

The authors propose the development of a national strategy regarding water security in Romania. As a starting point, one can start from England's strategy, which should be adapted to Romania's situation and needs. Later, this can be transcribed into a plan of measures, that can be enforced at a national or local level, whose implementation will lead to the achievement of the desired outcomes: delivery of safe water where is needed and in a sufficient amount. In the end, the adequate measures should be taken before wastewater is released back into the environment.

Thus, the Romanian Water Security Strategy (RWSS) must have some defining characteristics: it must focus on customers and environments needs, it must be developed in compliance with the European and national legislation, it must be easily adapted to future needs and it must give autonomy to those who implement it, in accordance with their own particularities (geographical, social, economic, etc.).

Additionally, RWSS should be based several principles: legality, transparency, accessibility, predictability, accountability, evidence-based justification and guidance. The strategy must be developed in a simple manner, easy to follow, understand and assimilated by all concerned parties.

To ensure its success, the Ministry of Environment should be responsible for the development, implementation and monitoring of RWSS.
The authors propose the following structure:

1. Water in Romania – present and future.

In order to have an up-to-date picture of the actual situation regarding water in Romania, the Ministry of Environment must facilitate the provision and centralization of data from a multitude of authorities and operators. In order to ensure uniform collection and analysis, it would be advisable to create a digital platform, in which those who report should follow a specific format and at a predefined interval of time. The opportunity and the possibility of such an approach can be financed through non-reimbursable EU funds.

The list of authorities that should contribute must include: the National Institute of Statistics, the National Meteorological Administration, the country's Water Basin Administrations, water and sewer operators, sanitation operators, the Environmental Protection Agency, the Environmental Guard, Mining Authority Ministry of Energy (hydropower production) etc. Based on the collected data, real-time analyzes can be made so that decisions can be taken in order to minimize or eliminate risks. Moreover, predictions can be made, ideally for a

larger period of time, approx. (30 years) on the future challenges of water and its security. A contribution to this chapter can be made by the Romanian Universities as well.

2. Water demand

From the consumers perspective, one of the pillars of water security is the ability to deliver the needed product it in the required quantity and where it is needed. It would be ideal to assess water requirement throughout the national territory, depending on the season and the consumers: domestic, industrial or agricultural. Water and sewer operators as well as the National Meteorological Administration play a crucial role in analyzing current demand.

Predicting future demand is as important as knowing current water needs. Here, the National Institute of Statistics also plays an important role, which can make assumptions about future demographic concentrations and evolutions.

When analyzing water needs, a particularity proposed by the author is taking into account vulnerable social categories. Since access to water is a basic right, but this process comes with costs, authorities must assess the risk of ill-payments, and come up with solutions.

First of all, knowing the hydrological potential of water sources is important, in order to assess the ability to deliver this product at any time of the year, without syncope. Thus, each area must be subject to a hydrological balance sheet. Of course, the classification of water sources is equally important, being directly proportional to the time through which they can regenerate. If lakes can accumulate water from precipitation relatively quickly, infiltrations that feeds underground sources takes time. Responsible for this element of RWSS must be the national meteorology agency, water basin administrations and water and canal operators, who must have a continuous dialogue to avoid situations of *force majeure*.

A measure proposed by the author would be the creation of new water sources, where the situation allows it. Drilling can be done where there are unused underground sources, new reservoirs can be built, treatment plants can be supplied from other existing reservoirs in the area, provided that their water complies with the quality indicators. In exceptional cases, in coastal areas, reverse osmosis stations can be set up, if there are no other more economically accessible water sources.

Treatment systems are those intermediate elements between sources and distribution systems. Their strategic importance regarding water security comes down to 2 indicators: the maximum deliverable capacity and the quality of the water post treatment. Water and sewer operators are responsible for

these systems. The author's opinion is that, if the operators serving a certain area operate only one treatment plant, they must develop secondary capacities, able to take over the load in case the main plant breaks down. These can consist either in other stations or in creating parallel flows in the main station, thereby increasing its capacity.

Distribution is the last element of a water supply system. From a strategic point of view, water operators, as the entities responsible for these systems, must ensure that the water will not alter its quality during the time it is transported to the customers. For this to happen, a series of steps must be followed:

- First of all, it is imperative to know the exact situation of the distribution systems.
- After an analysis of the old segments, strategic decisions can be made, whereby projects are constantly implemented to modernize the existing distribution systems. Thus, it is possible to opt for the use of pipes made of materials that do not rust and that hinder the formation of biofilm.
- The use of intelligent sensor systems, which can alert operators in real time regarding the occurrence of breakdowns situations.
- The system must be operated at a high pressure, which, in the event of a failure, prevents elements from the environment from entering the distribution system.

Such projects may be subject to financing mechanisms with non-reimbursable funds.

This chapter must distinctly address the supply of consumers already connected to centralized water supply systems and those who currently do not benefit from such utilities. Through non-reimbursable financing, it is possible to ensure the expansion of the current distribution systems, or the construction of new ones, where this is economically feasible and where European legislation requires it.

From the author's perspective, the interconnection of water and sewer operators would significantly contribute to ensuring water supply in dry periods, when the sources of some operators would fail to supply the needed volume.

3. Water quality in the environment

Water quality in the environment must be addressed from several points of view: raw water that's going to be treated for consumption, the resulting wastewater and water as a resource for agriculture, industry or tourism (recreational activities).

First of all, a high-quality water source stands at the basis of the water security concept. In addition to the legal obligation to respect certain physical, chemical and biological parameters, it is ideal that water should have the best possible quality, which involves less intensive treatment.

In order to ensure the water quality, continuous monitoring is needed, and when/where the situation requires it, coercive measures must be implemented. Monitoring must remain the responsibility of the water basin administrations and the Environmental Guard, which must have a permanent dialogue with the water operators. In the case of remote sources (such as springs or wells), monitoring must be done by the Public Health Directorate. Ideally, this should be done on its own initiative, not at the request of citizens.

In addition to monitoring, water quality must be safeguarded by a series of protective measures that ensure the limitation of accidental or intentional water pollution situations. In addition to the minimum measures required by the law, the water basin administrations and/or local authorities in the areas where the water sources are located can implement additional protection measures to reduce pollution. Moreover, awareness activities regarding water sources protection will actively contribute to the reduction of pollution. Such activities can be undertaken individually, by certain authorities, or they can be the subject of inter-institutional projects, intended to cover certain large areas or the entire national territory.

The concept of water quality in the environment must also be addressed from the perspective of waste water, which is to be returned to natural receptors. Water must meet certain legal standards. The water and sewer operators as well as the Environmental Guard must be responsible for this monitoring. The situation at national level is far from ideal, according to the Ministry of Environment report (2021). Water and sewer operators must implement expansion or construction projects of sewer systems and treatment plants. Ideally, sewage systems should be separated from rainwater catchment systems. Regarding the situation of households that use septic tanks, the Environmental Guard must ensure, within the limits of its capabilities, that these systems are compliant and do not contaminate underground or surface water.

European funding is the easiest solution for modernizing, expanding or building sewage systems and treatment plants. For this reason, the author's opinion is that the implementation of such projects must not fall strictly on the shoulders of water operators, but must be a joint effort, where the Ministry of Investments and European Funds can also contribute.

Water has also a recreational role. For activities involving bathing, it is important to ensure the necessary quality. Its monitoring must fall under the responsibility of the Directorate of Public Health.

The water needed for agricultural purposes must also meet certain quality standards, in order not to endanger the health of the population. The Environmental Guard could do the monitoring, especially if water from certain anthropogenic activities is used.

Similarly, water must have a certain quality if it is used in industrial activities. Since each technological process requires water of a certain quality, quality monitoring should be carried out by economic operators, through their own resources. In exceptional cases, when the water parameters exceed the norms of the legal framework, economic operators must notify the competent authorities.

4. Water as an economic good

According to Siskaa and Takara (2015), too much or too little water affects the economy and even has a directly correlated impact in the GDP of a developing country.

For this reason, it must be properly managed in order to have a high added value on the economy and people's lives.

On one hand, unrestricted access to water is a constitutional right, but, like any public service, it must be a self-sustainable one, to ensure the continuity of deliveries, at the required quality standard. Thus, setting a fair price that covers all the costs of producing, distributing, collecting and purifying water is mandatory.

Since water, like any other resource, is limited, it is imperative to implement management measures that limit losses and ensure its judicious use or reuse.

Of course, setting a price and implementing measures to manage water as a good is strictly the prerogative of water and sewage operators. For this reason, the author's opinion is that they must have a high degree of autonomy in order to make the best decisions. Moreover, they must also obtain a profit margin from the activity undertaken, in order to be able to co-finance investment or research and development projects.

Non-compliance with the legislation norms must be sanctioned according to the law, which is why the Environmental Guard must act according to the "polluter pays" principle.

Since water is an indispensable good for life and its quality, the author suggests performing an analysis regarding the opportunity of establishing preferential prices for disadvantaged or vulnerable categories. Aid schemes can also be a solution, similar to those that exist in the energy sector. This is where the Ministry of Labor and Social Solidarity could make its contribution.

Moreover, since water is a strategic sector, the author's opinion is that the majority of the social capital of water and sewage operators must be owned by local or county councils.

5. Floods

Flood management is the subject of a separate strategy, which is based on HG 846 from 2010, where the National Administration of Romanian Waters and the Inspectorate for Emergency Situations play a crucial role. All operational measures and those responsible for implementation are mentioned in the respective Government decision.

In addition to the measures provided for in the respective normative act, the author opinion is that, in order to prevent such calamities, it is necessary to implement projects for maintaining and expanding protective dykes and dredging of riverbeds, activities that could benefit from European funding and which would fall under the responsibility of water basin administrations and the Ministry of Investments and European Funds. Moreover, the efforts to combat deforestation upstream must be increased, a responsibility that can be shared between the forestry departments and the Ministry of Internal Affairs, and where possible, reforestation measures must be implemented.

Such situations of *force majeure* can negatively influence the quality of water sources, its treatment and distribution to consumers. In order to minimize the negative impact felt by the population, the author proposes that the local authorities and the Inspectorate for Emergency Situations must be equipped, on the one hand, with a greater number of cisterns to bring water from safe sources, and on the other hand, to use compact mini-water treatment plants to provide drinking water for disaster-affected areas. Such treatment systems must meet certain conditions: to be easily transported, fitted, operated and maintained, to be reliable, to be able to operate in series according to the need for water production, to be affordable, and have a stock of spare parts as well as a spare parts distributor in the area, if needed.

6. Greenhouse gas emissions

Although the water industry is not by nature a big polluter (has low greenhouse gases emissions), efforts to combat climate change are on the agendas of many countries, which is why it is important for RWSS to address this aspect as well.

Local water operators are responsible for active measures in this regard. Their activity, as well as other human activities, is one that produces greenhouse gases. Thus, they must launch projects to reduce their CO_2 or CH_4 emissions. Again, the author's opinion is that they must set a percentage

(target) to be achieved, but they must have decision-making autonomy regarding which measures can be implemented and have economic support to do so.

Moreover, the author has additional suggestions: the use of technologies that require less operating energy, energy purchase from renewable sources, implementation of green energy production systems (solar, wind or hydro) where possible (roof of buildings, adjacent spaces). In addition, an increasing efficiency of wastewater treatment plants should be aimed at, by obtaining a higher production of CH_4, which would later be used for own energy consumption.

The author also proposes the implementation of awareness activities, through which the population is presented with the benefits of reducing water consumption. Besides direct savings for customers, a reduction of CO_2 production will occur, since less operational energy will be required.

7. Competition and innovation framework.

Research & development (R&D) activities have a crucial role in the economy development and in the overall progress of a society. The lack of such programs condemns a state to fall behind technologically, or to spend considerable larger sums to acquire technology and knowledge. Since Romania is not a rich state, the author's opinion is that innovation is the optimal way to reduce the gap between itself and the western countries.

Research & development activities were constantly underfunded in Romania. Moreover, they always had a predominantly theoretical character, with little impact on the market. In order to change this, the Romanian Government developed the National Plan for Research, Development and Innovation 2022-2027, budgeted with 60 billion lei from various sources. This is structured in 10 projects, two of which could also target projects related to the security of water sources. Thus, through the "Human Resources" project, exceptional researchers (doctoral students, post-doctoral students or young researchers) can be attracted to the national research system, and, through the "Research in areas of strategic interest" program, new technologies can be developed in the field of water treatment, distribution and purification.

The author proposes, through RWSS, the creation of a trio, which ensures the creation of technology for the market, with a high and immediate impact, thus moving from theoretical to practical research. The 3 elements of the winning formula are:

1. The beneficiary entity, be it public or private. These could include water and sewer operators who want to improve their services & technology. They must be the funders of the research projects, and subsequently, the beneficiaries of the results.

2. Research institutes or universities. These represent the platforms that ensure the "meeting" between beneficiaries and PhD students, their role being to provide the infrastructure (laboratories, consumables) and know-how (by purchasing subscriptions to large electronic bookstores, e.g. Elsevier).
3. The doctoral student. It goes without saying that human resource is the most important.

Through such a win-win-win formula, Romanian water and sewer operators could finance, at low costs, research and development projects aimed for their needs. Research institutes or Universities would have a constant portfolio of requests and increase their institutional brand by constantly delivering research articles and technologies that would be immediately implemented in the market. Doctoral students would have the opportunity to do research with a practical purpose, to be paid during this time (including by the beneficiaries), and, subsequently, they have the opportunity to work for the entities that supported the research projects (beneficiaries or universities).

Strategies and plans: a comparative analysis

By comparing the 5 materials (4 studied and one proposed by the author), the author tried to capture the differences and common visions, as shown in the figure 1. At the center are common ideas, mentioned in one form or another in both strategies and management plans. Separately, some elements on which additional emphasis is placed in the 5 materials are indicated.

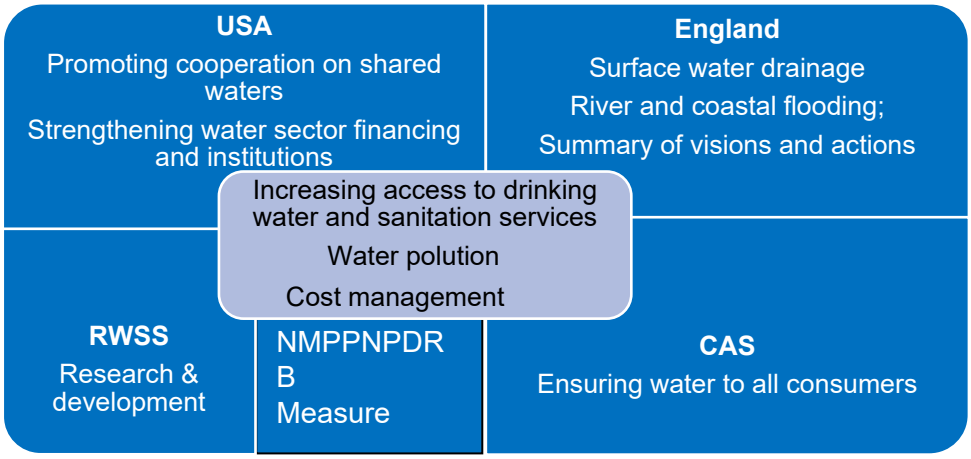

Fig. 1. *Comparison (differences/commonalities) between the analyzed strategies*

Comparing the author's proposed RWSS and the draft NSWM, some common approaches can be observed, as shown in table 2.

Table 2. *Comparison of RWSS vs. NSWM*

Specifically RWSS	Common aspects	Specifically NSWM
1. Water as an economic good 2. Greenhouse gases	1. Assessment of the current water situation 2. Research & Development 3. Floods 4. Water supply and quality	1. Strategic planning 2. Implementation, evaluation and process monitoring 3. Sources of funding

CONCLUSIONS AND RECOMMENDATIONS

This article compares completely different paradigms on the concept of water security, with the final objective of identifying some elements that can represent the foundation of a future Romanian national strategy on this subject.

The US water security strategy is one with global impact, through which this state projects its national interests, being also a foreign policy tool. For this country, the importance of water security is mentioned in the National Security of the state.

In the case of England, this state has developed a national strategy, which clearly sets out for water companies the objectives to be achieved, while leaving them a measure of autonomy to identify their best approaches.

The Romanian state does not have a national strategy regarding water security. However, it is in the process of completing and implement a water management strategy. In addition, Romania developed a national management plan for the national portion of the international river basin of the Danube River, which undergoes updates every few years. It has a very broad content and general character. The lack of early strategies has left it up to the water companies to develop their own action plans if they see fit.

For these reasons, the author of the article has several recommendations:

I. Romania, through the Ministry of the Environment, should develop a national Romania Water Security Strategy, in the spirit of European or national legislation. The author has developed and proposes a strategy model, focused on 8 chapters. This strategy can be complementary to the National Strategy for Water Management, which is in the process of being finalized and implemented.

II. If the Romanian state will not develop a national strategy, the CAS water operator should develop its own strategy based on the Master Plan created in 2006. The strategy must be public, transparent, easily assimilated and implemented, comprehensive and adapted, both to the customers, as well as the partners involved in the ongoing projects.

III. In the future, depending on the evolution of certain factors such as global warming, pollution, demographic changes, or the regional security status etc. the security of water sources should be a part of Romania's National Security Strategy. Such a policy, like the one already implemented in the USA, would enable other institutions to jointly use their resources in order to achieve the desired objectives regarding protection, treatment, judicious use and purification of wastewater, thus contributing to the quality of life of Romanian citizens.

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